

# Assessing PFAS Uptake by Vegetables

## Field Studies

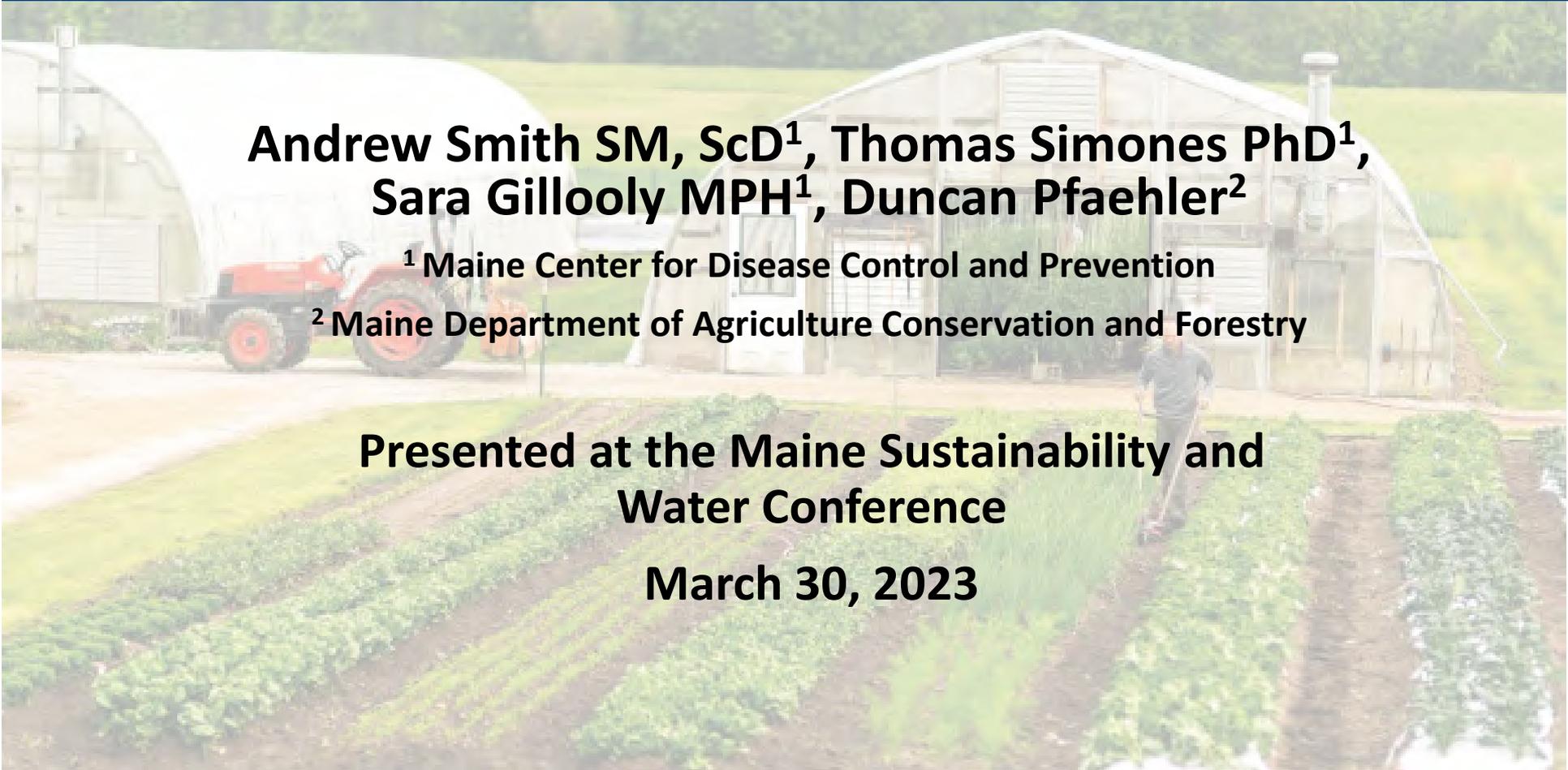
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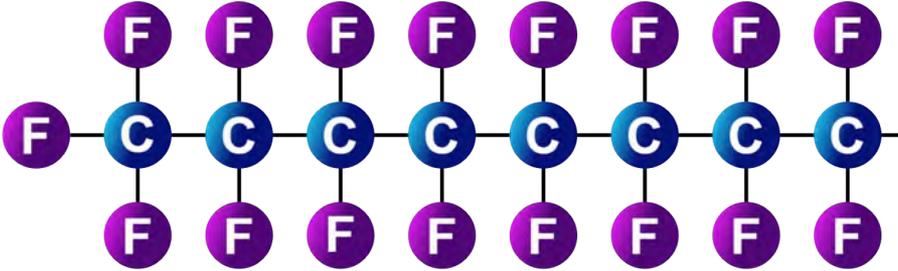
**Presented at the Maine Sustainability and  
Water Conference**

**March 30, 2023**

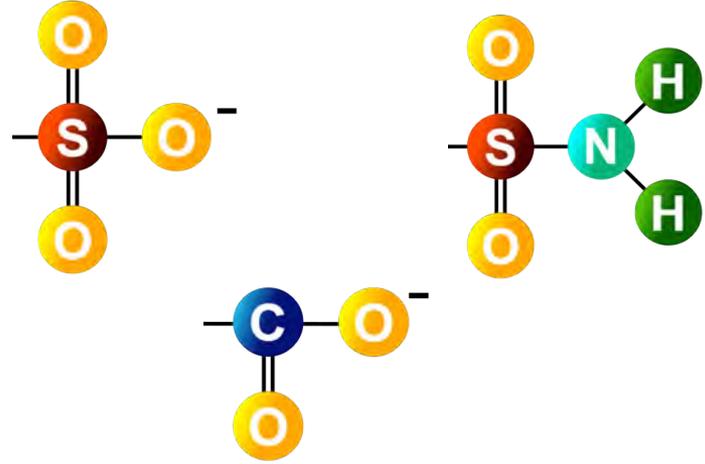


# Per- and Polyfluorinated Alkyl Substances (PFAS)

Fluorinated Carbon Chain (“Tail”)  
*repelled from water*



Functional Group (“Head”)  
*attracted to water*



**C** Carbon

**F** Fluorine

**O** Oxygen

**S** Sulfur

**N** Nitrogen

**H** Hydrogen

# Land Application of Biosolids

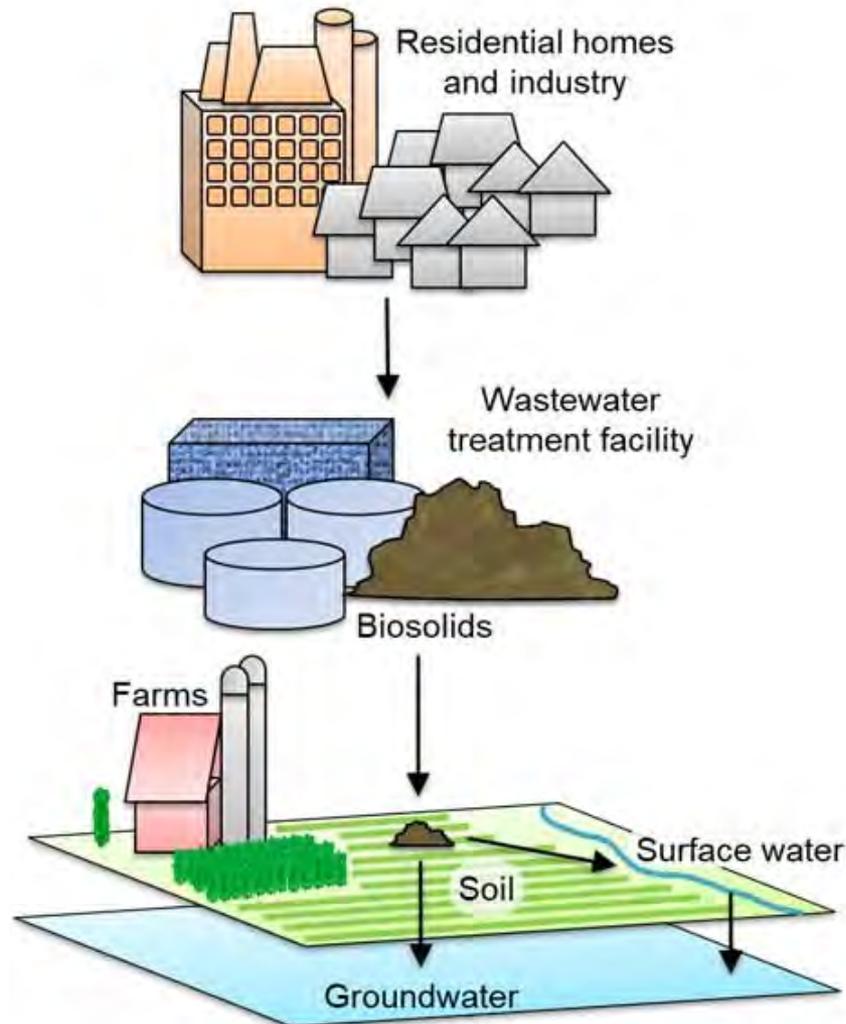


Image: Diana Oviedo-Vargas, Ph.D., Stroud Water Research Center

# Opportunistic Field Sampling



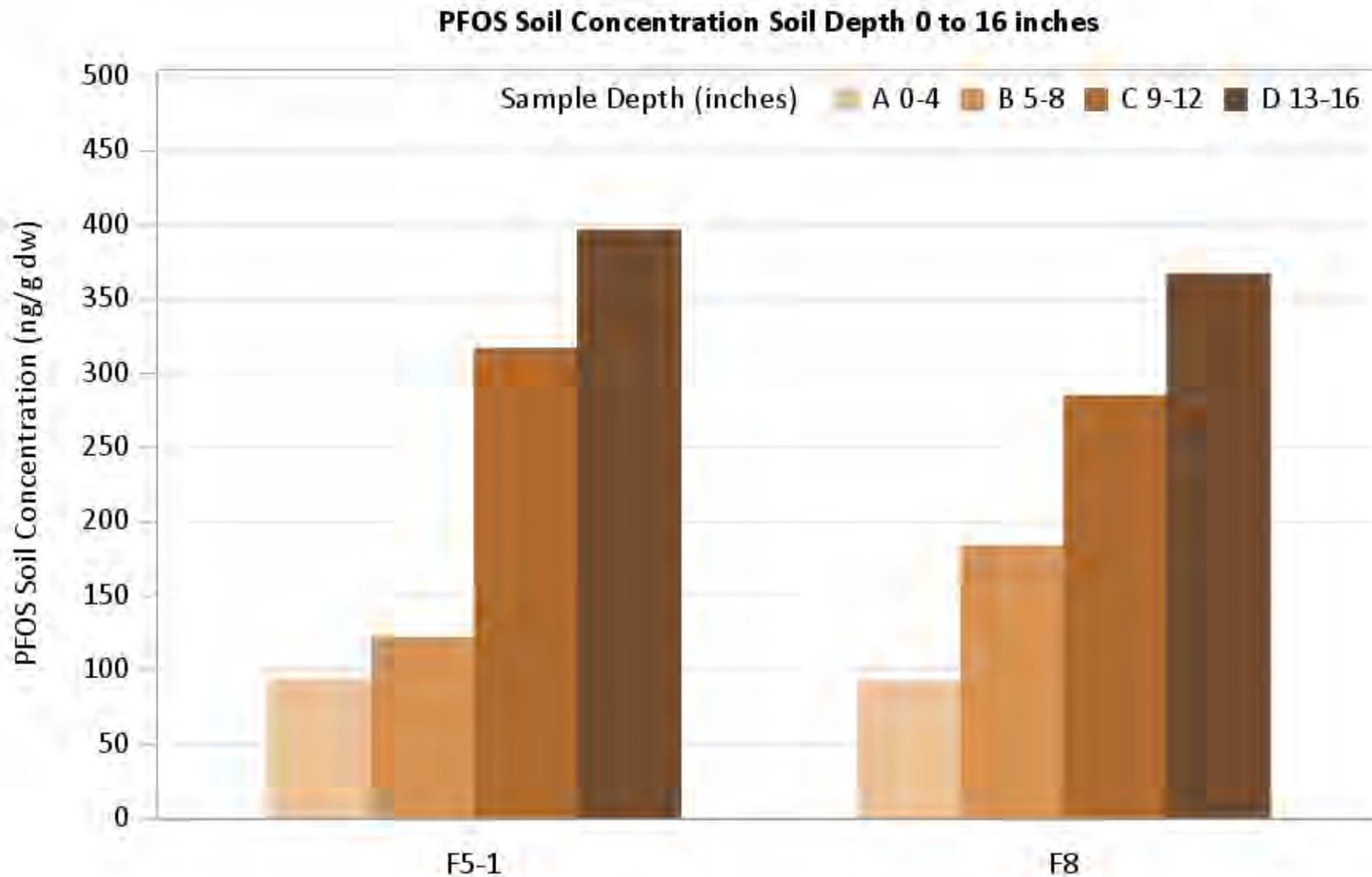
# Methods



Work in Progress – Do not cite

Maine Department of Health and Human Services

# PFAS Soil Depth Profiles



# Lab PFAS Analysis Methods

## Soils



- PFAS analysis method modified EPA 537.1  
LC-MS/MS isotope dilution
- Matrix spikes and lab duplicates and field duplicates

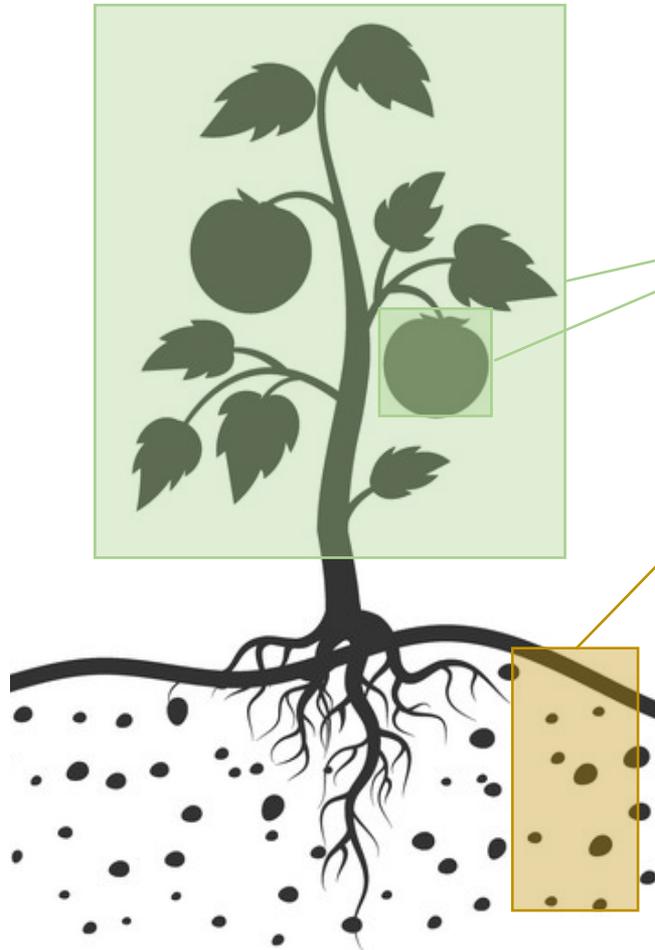


## Plants



- Cryogrind homogenization
- PFAS analysis method -  
DoD QSM 5.3 Table B-15  
LC-MS/MS isotope dilution
- Matrix spikes and lab duplicates

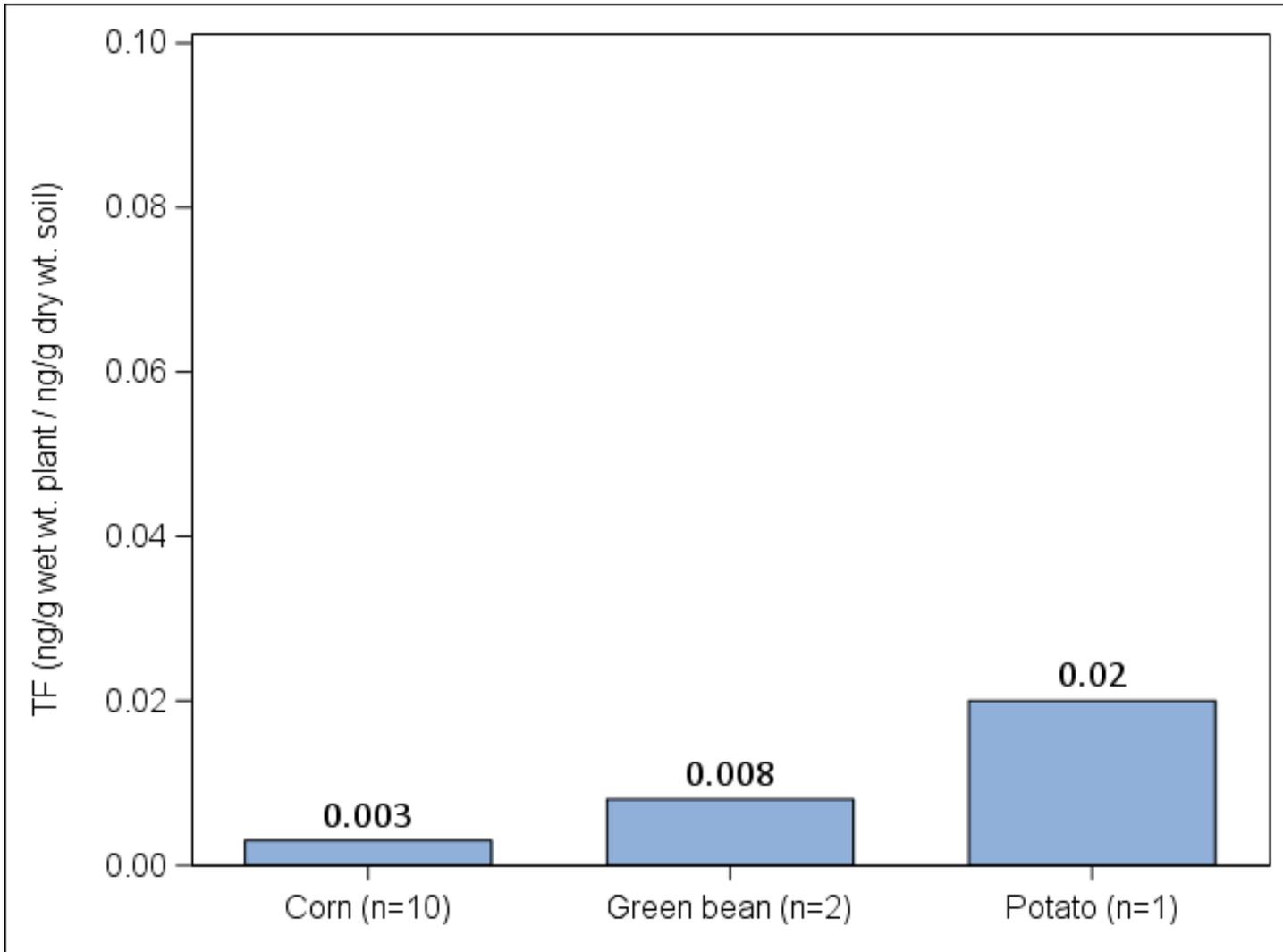
# Plant “Transfer Factor”



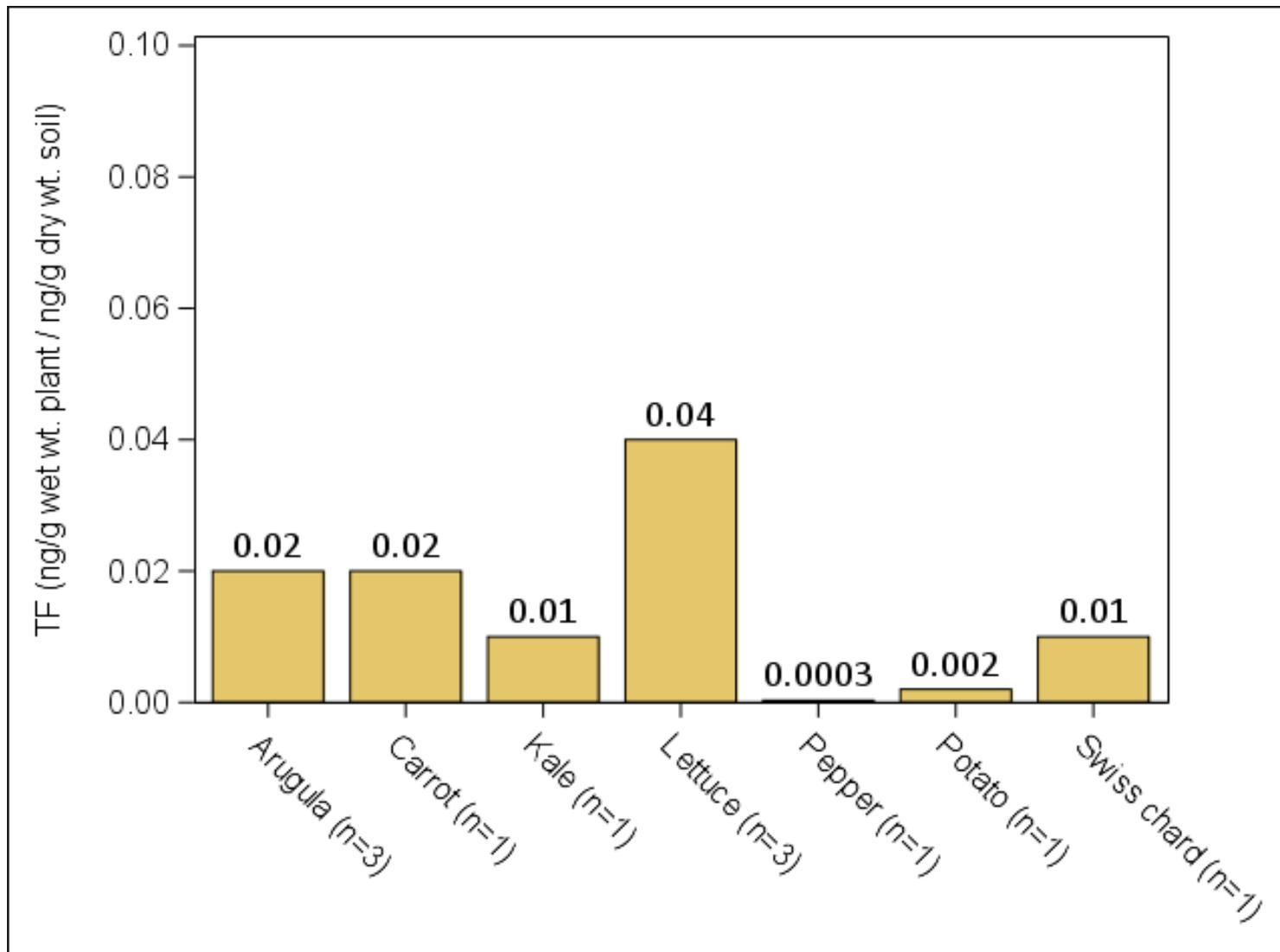
$$\frac{[Plant_{PFAS} \text{ } ww]}{[Soil_{PFAS} \text{ } dw]}$$

Transfer Factor = Ratio of PFAS concentration in the plant on a wet weight basis to the PFAS concentration to the soil on a dry weight basis

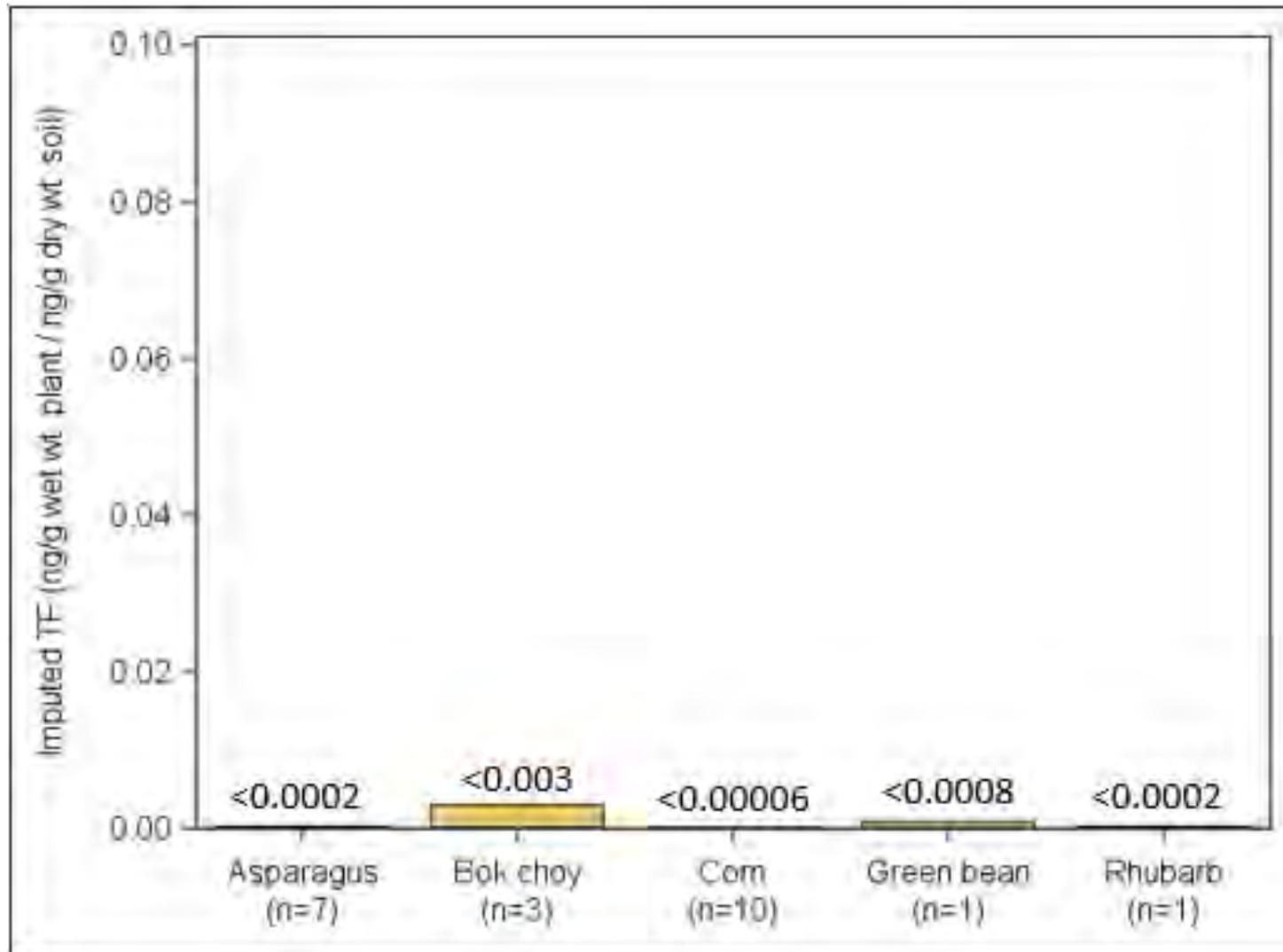
# PFOA Transfer Factors for Vegetables



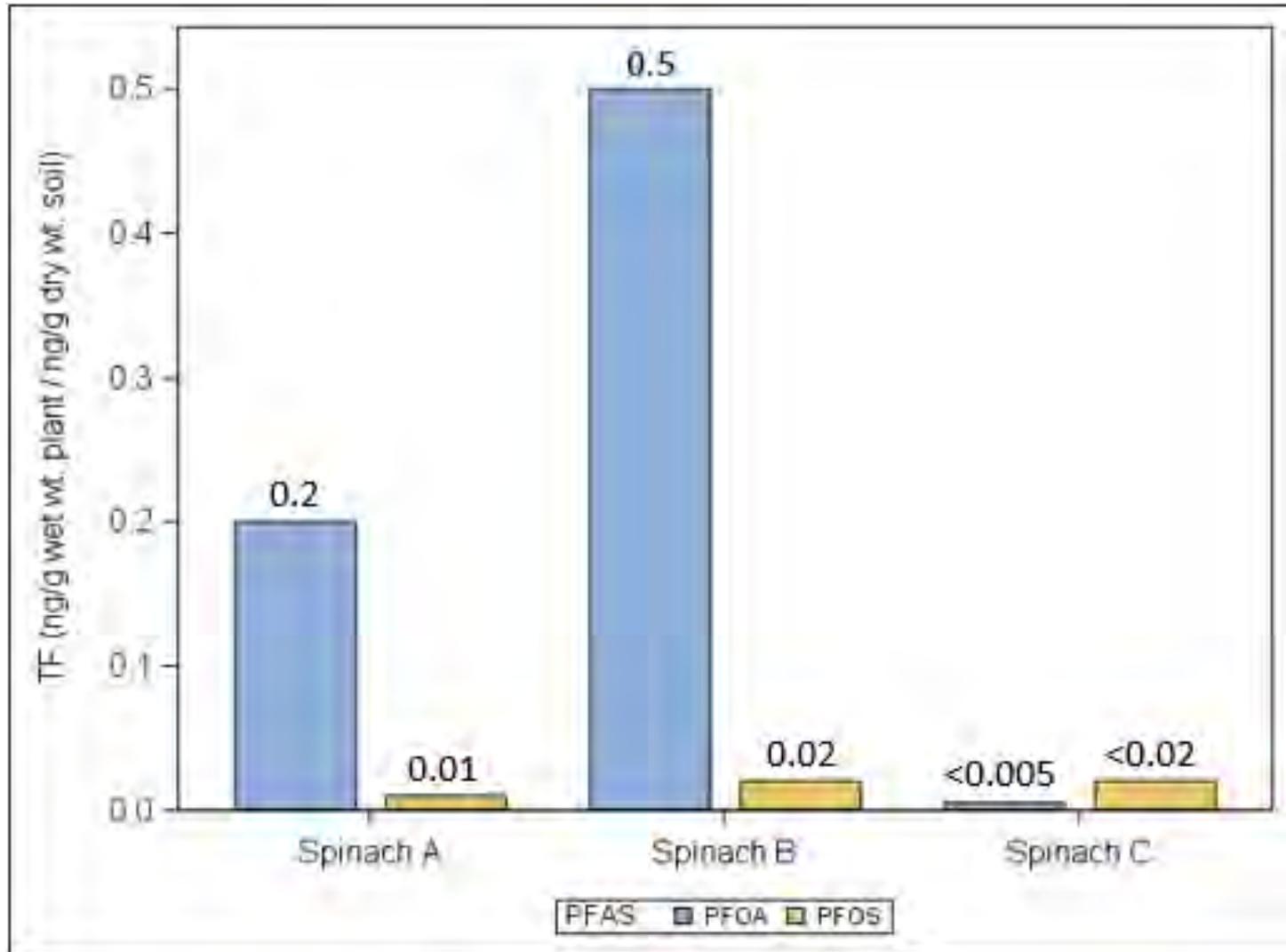
# PFOS Transfer Factors for Vegetables



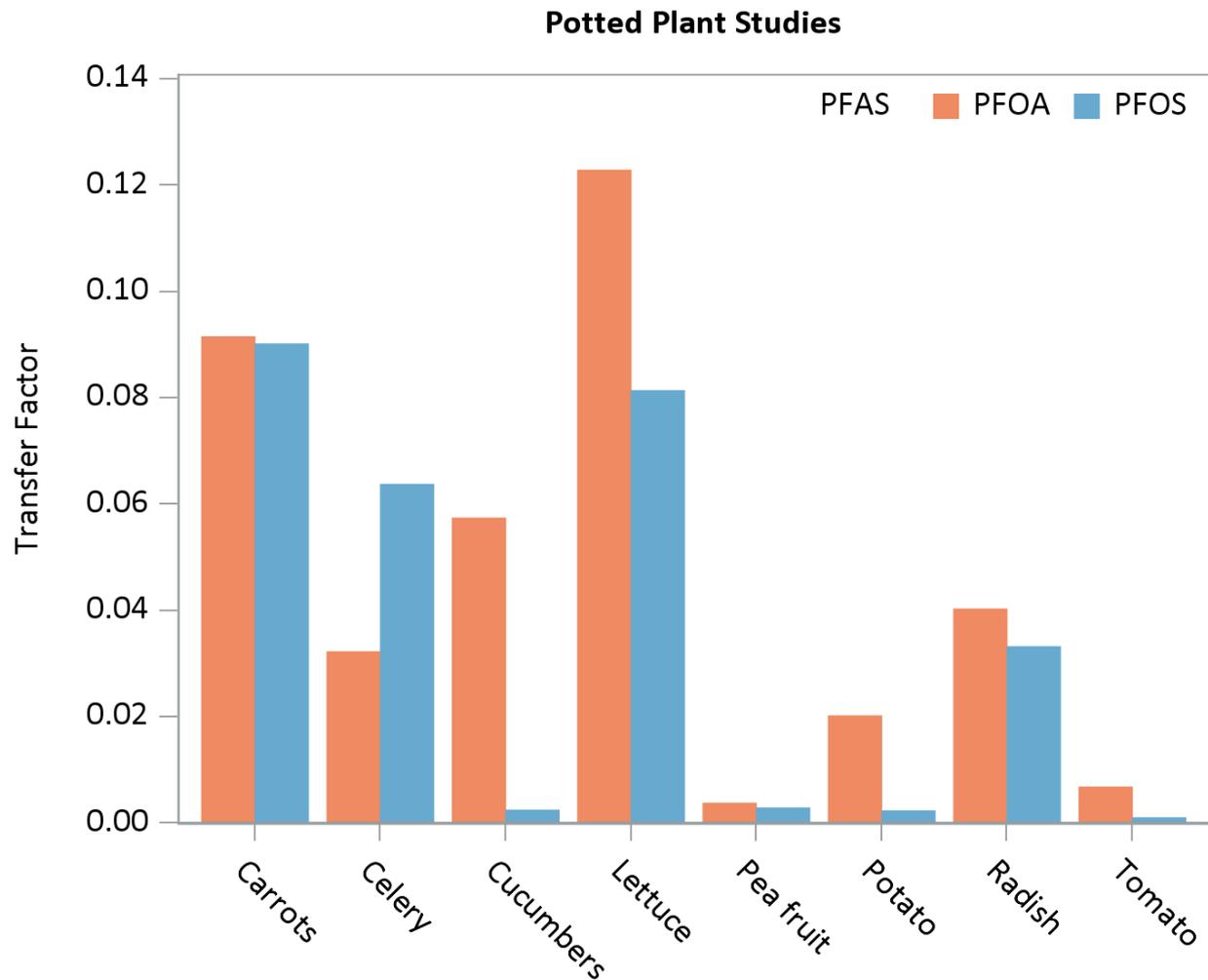
# Imputed PFOS Transfer Factors for Vegetables



# PFOA and PFOS Transfer Factors for Spinach



# Transfer Factors from Published Studies

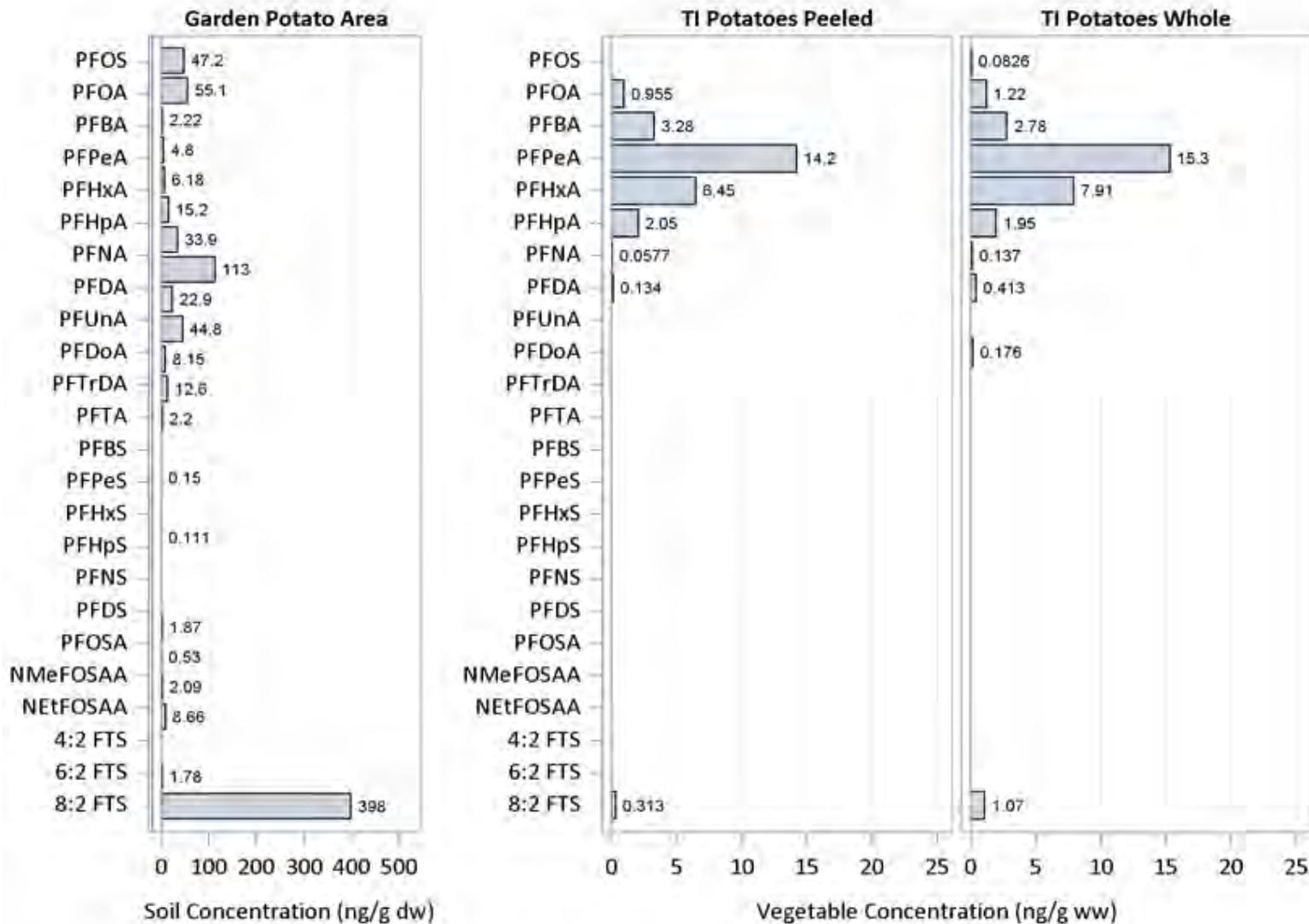


Sources: Blaine et al. 2013 <https://pubs.acs.org/doi/abs/10.1021/es403094q>

Blaine et al. 2014 <https://pubs.acs.org/doi/abs/10.1021/es500016s>

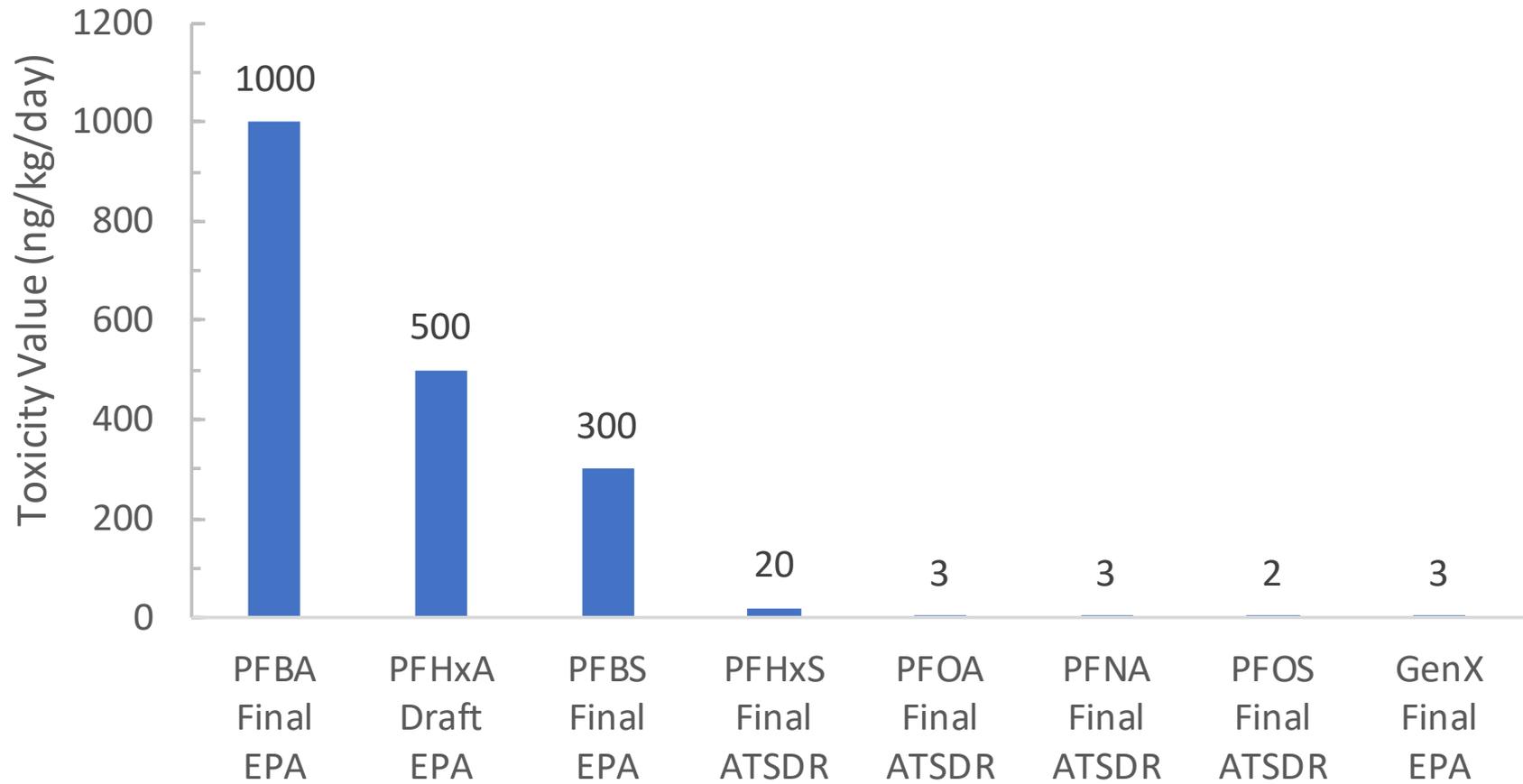
Lechner and Knapp. 2011. <https://pubs.acs.org/doi/10.1021/jf201355y>

# Uptake of PFAS by Potatoes



# Toxicity Values Vary by PFAS

PFAS Toxicity Values



# Questions?

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# Uptake of PFAS by Spinach

